REMARKS

Claims 1-39 were pending in the application. Claims 1-21 were rejected. Claims 31-39 were withdrawn from consideration. Claims 31-39 are canceled. Claim 1 is amended. Claims 1-21 remain pending in the application. Claim 1 is the independent claim. Reconsideration of the amended application is respectfully requested.

The Examiner asserted that the application claims two distinct inventions, required restriction, and constructively elected the invention recited in claims 1-21. This constructive election is confirmed, and withdrawn claims 31-39 are canceled.

The Examiner rejected claims 1, 2, and 5-14 under 35 USC §102(a) as being anticipated by Wilkinson et al. The Examiner also rejected claims 3, 4, and 15 under 35 USC §103(a) as being unpatentable over Wilkinson et al.

Independent claim 1 recites a method of improving the performance of a direct feed fuel cell having an anode comprising a CO-tolerant catalyst, a solid polymer electrolyte, and a cathode. The fuel cell provides output power to a load in an operating range from a minimum operational output level to a maximum operational output level. A supply of fuel is provided to the anode for the oxidation of the fuel to produce an oxidation product and electrons at the anode. A supply of oxidant is provided to the cathode for reduction of the oxidant, thereby producing a reduction product. The output power of the fuel cell to the load is reduced at predetermined time intervals to be less than the minimum operational output level. Thus, the fuel cell provides output power to a load within an operating range, except during predetermined intervals in time during which the output power to the load is reduced to a level that is below the minimum operational output level.

In contrast, Wilkinson et al. disclose a method and apparatus for operating an electrochemical fuel cell with periodic fuel starvation at the anode. The term "fuel starvation" refers to operating a fuel cell with reduced reactant supply, particularly at a reactant fuel rate that is not sufficient to maintain a constant electrical current. As noted in the abstract, localized portions of the fuel cell anode are momentarily periodically fuel starved, while the remainder of the fuel cell anode remains electrochemically active and saturated with fuel such that the fuel cell is continually available to generate power. Thus, where the claimed invention reduces the output power of the fuel cell during predetermined intervals such that the output power falls below an operating range, Wilkinson et al. periodically fuel starve portions of a fuel cell anode while keeping the fuel cell output within the operating range.

The Examiner cited Wilkinson et al. claim 1 and column 2, line 65 *et seq.* as disclosing the elements of Applicants' claim 1. Wilkinson et al. claim 1 recites periodic fuel starvation of the anode, but also recites that the fuel cell continues to produce electrical power during the fuel starvation. Taken in context of the abstract and the written description, it can be fairly inferred that this power production falls within the contemplated operating range for a given load, and not below it. Column 2, line 65 through column 3, line 30 also disclose reduction of the output power, but not to a level below the operating range. In fact, at column 3, lines 25-30, Wilkinson et al. describe the prevention of simultaneous interruption of the supply of fuel to each anode of the fuel cells, in order to reduce fluctuations in the electrical power output.

The Examiner further cites column 11, lines 43 et seq. as disclosing periodic reduction of the fuel cell power output. In this example, the fuel cell is periodically fuel

starved, resulting in respective reduction of the output voltage, as shown in Fig. 8. However, Wilkinson et al. do not disclose that the power output drops below the operating range. In fact, the conclusion reached by Wilkinson et al. based on the results of this example is that it is possible to periodically starve the fuel cell while still generating a continuous supply of power. See column 12, lines 1-7.

The Examiner asserted that the designation of power output values within an operational range are arbitrary and simply a matter of semantics. It is respectfully submitted that this is not the case. It is axiomatic that a fuel cell must provide power within a range necessary to satisfy a load in a given system, otherwise the system will not operate as intended. This is the operating range of the fuel cell by which the load is rated. The needs of the load define the operating range of the power supply, that is, the minimum operational output level and the maximum operational output level. A load has no use for semantics; outside the operating range, the load will not be satisfied. An operational output range is not arbitrary, but rather is a necessary design consideration.

The Examiner also argues that the claimed invention and the Wilkinson et al. invention are drawn to doing the same thing in the same way. It is respectfully submitted that this is not the case. The claimed invention improves the performance of a fuel cell that provides output power to a load in an operating range by temporarily reducing the output power of the fuel cell to the load such that it is less than the minimum operational output level, that is, below the operating range. In contrast, Wilkinson et al. provide a fuel stack made up of individual fuel cells. Each individual fuel cell in the stack always provides output power at a level below the operating range for the load, but the overall fuel cell stack provides output power to the load within the operating range. Wilkinson et

al. sequentially starve individual fuel cells, but the power output of the stack never dips below the operational minimum level. That is, the claimed invention provides a fuel cell that alternately provides a power output within an operational range for a load and below the operational range for the load. In contrast, Wilkinson et al. provide individual fuel cells that always provide output power below the operational range of the load, and a fuel cell stack that always provides output power within an operational range for a load.

In the context of a fuel cell system, such as a hybridized fuel cell system, the claimed invention can be used, for example, to improve the life and performance of a fuel cell by periodically and automatically turning off the fuel cell and providing output power from another source, such as a capacitor or battery (see, for example, page 8, line 17 through page 9, line 2). Wilkinson et al., on the other hand, disclose a fuel cell system that necessarily constantly provides operational output power, and which would not be used in a hybrid-type system.

According to the claimed invention, output power of the fuel cell is selectively reduced or interrupted, while the reactants continue flowing. In contrast, according to Wilkinson et al., the flow of reactants is selectively interrupted or reduced, while the output power is provided uninterrupted. Each invention has the objective of improving the performance of the fuel cell, but the objective is achieved in each case in functionally opposite ways. According to Wilkinson et al., the electrochemical overpotentials of the fuel cell electrodes are always increased, whereas according to the claimed invention, the overpotentials are reduced due to the load reduction.

As described above, Applicants and Wilkinson et al. satisfy their respective objectives using different processes. It is respectfully submitted that Wilkinson et al. do

not anticipate the invention recited in claim 1. Claims 2 and 5-14 depend from claim 1, and therefore also cannot be anticipated by Wilkinson et al. Claims 3, 4, and 15 also depend from claim 1, and therefore cannot be rendered obvious by Wilkinson et al. The rejection of claims 1-15, therefore, should be withdrawn.

The Examiner rejected claims 16-20 under 35 USC §103(a) as being unpatentable over Wilkinson et al., in view of Lyons et al. The Examiner also rejected claim 21 as being unpatentable over Wilkinson et al., in view of Lyons et al., and further in view of Finkelshtain.

Lyons discloses an electrolytic cell. In the passage cited by the Examiner, the cell is connected to a load by way of a switch, which is opened and closed at a rapid rate to disconnect and reconnect the load from and to the cell, in order to correct an overvoltage condition. However, it is Wilkinson's stated goal that operational power to the load should not be interrupted. The entire purpose of the Wilkinson et al. invention is to fuel starve the fuel cell in order to remove impurities, while at the same time not interrupting operational power. Thus, to combine the teachings of the cited references would frustrate the intentions of Wilkinson et al. Further, Wilkinson et al. switch open particular fuel cell circuits in order to starve the cells; Lyons switches the fuel cell circuit in order to correct an overvoltage condition. It cannot be fairly asserted that Lyons teaches one of skill in the art anything at all about switching conditions in a fuel starvation scenario. There is no motivation provided to combine the teachings of these two references, and one skilled in the art would not find any obvious advantage to combine the teachings.

In Paragraph 11, the Examiner misstated Applicants' position regarding Wilkinson et al.'s stated goal. It is Applicants' position that Wilkinson et al. aim to

starve individual fuel cells without interrupting the fuel supply. See, for example, the abstract, column 12, lines 1-7, and Fig. 8 of the Wilkinson et al. reference. This position is consistent with the foregoing remarks.

For at least the foregoing reasons, no combination of the cited references could render obvious the claimed invention. The rejection of claims 16-21, therefore, should be withdrawn.

The Examiner made the action final, claiming that the previous Amendment necessitated the new grounds of rejection. It is respectfully submitted that this is not the case. Applicants' previous amendments merely clarified the claim language; no substantive changes were made, and Applicants' previous remarks did not rely on any changes made to the claims. Further, the Examiner's new grounds of rejection in the present action are not directed to any of the language changes made in the previous Amendment. It is therefore submitted that the Examiner's deeming the action final is premature, and should be withdrawn.

Based on the foregoing, it is submitted that all objections and rejections have been overcome. It is therefore requested that the Amendment be entered, the claims allowed, and the case passed to issue. If any issues remain unresolved, the Examiner is encouraged to contact the undersigned by telephone to expedite resolution.

Respectfully submitted,

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